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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/051,228	01/22/2002	Thomas Alan Taylor	CS-21182	7993
27182	7590	12/29/2003	EXAMINER	
PRAXAIR, INC. LAW DEPARTMENT - M1 557 39 OLD RIDGEBURY ROAD DANBURY, CT 06810-5113			MCNEIL, JENNIFER C	
			ART UNIT	PAPER NUMBER
			1775	

DATE MAILED: 12/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/051,228

Applicant(s)

TAYLOR ET AL.

Examiner

Jennifer C McNeil

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-6,9-15,17-30,32-35,37 and 38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4,9-13,17-30,32-35,37 and 38 is/are rejected.
- 7) ☐ Claim(s) 5,6,14 and 15 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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DETAILED ACTION\

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, 4, 9-13, 17-25, 27-30, 32-35, 37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor et al (US 5,073,433) in view of Graham et al (US 6,432,487). Taylor teaches a thermal barrier coating for a metal substrate. The thermal barrier coating comprises zirconia stabilized with yttria with a density greater than 88% and a plurality of macrocracks homogeneously dispersed throughout the coating to improve its thermal fatigue resistance. Taylor does not teach an additional coating thereon that does not include macrocracks. Graham teaches that dense vertically cracked zirconia layers are too dense to abrade and provides a sacrificial layer on the dense layer that is easier to remove and serves as an indicator to operators for thickness limits. Both Graham and Taylor teach that the coatings are used in turbine engine components. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a sacrificial layer such as that of Graham, on the vertically cracked layer of Taylor to provide an indicator during use that the coating is reaching its thickness limits.

Regarding claims 3, 9, 10, 12, 17 and 18, Taylor teaches that horizontal microcracks may also be present, and may be 5-25 % of the average length of the vertical cracks.

Regarding claims 4 and 13, Taylor teaches that the macrocracked layer may be applied by multiple monolayers, each having cracks.

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Regarding the number of microcracks, Taylor teaches that there are at least 20 vertical macrocracks per linear inch, which converts to 50 per linear centimeter.

Regarding claims 19-21, while Graham does not teach the density of the outer layer, it is clearly stated that the outer zirconia layer is less dense and is purposefully softer and easier to abrade. It would have been obvious to one of ordinary skill to form the outer layer with a density sufficient to allow increased softness and abrasability.

Regarding claims 22 and 23, it would have been obvious to one of ordinary skill to provide the layers at a thickness that would provide the desired corrosion resistance to the underlying substrate.

Regarding claim 24, the zirconia may be stabilized by yttria.

Regarding claim 25, Taylor teaches the use of a bond coat between the substrate and the coating.

Claim 27 is considered a method limitation for an article and is not considered to structurally define over the prior art.

Regarding claims 29, 30, 32, 34, 35, and 37 Taylor teaches that the coating may be used for turbine engine seals.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taylor et al (US 5,073,433) and Graham et al (US 6,432,487) as applied to claim 25 above, and further in view of Gupta et al (US 5,403,669). Please see the previous office action for the text of the rejection.

Allowable Subject Matter

Claims 5, 6, 14, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's amendments have overcome the 102 rejections over Chen '069, Nissley '656, Good '002, and Graham '487, as well as the 103 rejections over Chen and Gupta, Nissley and Gupta, and Good and Gupta. The 103 rejections over Taylor '433 and Graham '487, and also Taylor, Graham and Gupta '669 are held because applicant's arguments filed October 14, 2003 have been fully considered but they are not persuasive.

Applicant amended the independent claims to include the limitations of the number of cracks per centimeter. Applicant argues that Taylor does not disclose or suggest a multilayer ceramic thermal barrier and abradable coating comprising an inner ceramic layer with specifically defined vertical macrocracks and an outer ceramic abradable layer free of macrocracks.

Taylor teaches a thermal barrier coating that has at least 20 vertical macrocracks per linear inch, which converts to 50 per linear centimeter, which clearly falls within the range claimed by applicant. It is agreed that Taylor does not teach an additional layer on the dense vertically cracked layer. It is noted that Taylor clearly teaches that the dense vertically cracked layer is useful for blades, vanes, and seals of gas turbine engines (col. 4, lines 48-50). Graham teaches a coating for a gas turbine engine component. Graham teaches that dense vertically cracked layers are not suitable alone for use as in gas turbine engines because the process used to achieve the required characteristics produce a rough surface that is unacceptable. To remedy this, Graham teaches the application of a less dense, easily abradable layer to the layer of dense zirconia. This provides a "fail-safe" indicator so an operator is immediately aware that minimum thickness limits are being approached. From this teaching it is considered obvious to one of ordinary skill to apply the additional layer of Graham to the dense layer of Taylor to provide a "fail-safe" or indicator during use, as well as provide an acceptable surface. Graham's outer layer is porous and is not considered to be cracked, as it is clearly taught in contrast to the underlying dense layer. Graham clearly teaches that the underlying dense layer is not suitable and that specific deposition must take

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place to accomplish the dense layer with cracks, whereas the outer layer is of a different structure than the underlying layer.

Applicant argues that Graham is silent with respect to the underlying layers length and frequency of cracks. Taylor clearly teaches the frequency and length of the cracks, and Graham is used not to establish specifics of the underlying dense cracked layer, but to show that it is known and necessary to apply a porous and abradable layer to the dense cracked layer.

Applicant argues that Graham does not teach a coating capable of high-speed tip rub abrasability. The outer layer of applicant's claims is referred to as "abradable". Graham teaches an abradable outer coating and teaches its use in turbine engine components, and this is considered to meet applicant's limitations in the claims. Furthermore, the layer of Graham is considered to capable of high-speed abrasability as it is taught for use in turbine engines.

Applicant argues that the examiner is using an "obvious to try" test for patentability. It is asserted that the teachings of Graham is sufficient to provide motivation, and is well beyond an "obvious to try" analysis.

In response to Applicant's argument that the Examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper, *In re McLaughlin*, 443 F.2d 1392; 170 USPQ 209 (CCPA 1971).

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Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer C McNeil whose telephone number is 703-305-0553. The examiner can normally be reached on 9AM-6PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on 703-308-3822. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



JCM
December 19, 2003